

WHAT IS CLAIMED IS:

1. A method of manufacturing a semiconductor device, said method comprising the steps of:

5 forming a semiconductor film over a first surface of a translucent substrate;

forming an insulating film on the semiconductor film;

forming a conductive film on the insulating film;

10 introducing an impurity into the semiconductor film to form a channel forming region, at least a low concentration impurity region and at least a high concentration impurity region;

wherein the channel forming region is overlapped with the conductive film;

wherein the low concentration impurity region is overlapped with a portion of the conductive film;

15 wherein at least one selected from the group consisting of a source region and a drain region comprises the high concentration impurity region;

irradiating with a first laser light from the first surface and with a second laser light from a second surface of the translucent substrate to activate the impurity,

20 wherein the second laser light is a portion of the first laser light which is transmitted through the translucent substrate and reflected by a reflector;

wherein the reflector is formed adjacent to the second surface of the translucent substrate.

2. A method of manufacturing a semiconductor device, said method

comprising the steps of:

forming a semiconductor film over a first surface of a translucent substrate;

forming an insulating film on the semiconductor film;

5 forming a conductive film on the insulating film;

introducing an impurity into the semiconductor film to form a channel forming region, at least a low concentration impurity region and at least a high concentration impurity region;

10 wherein the channel forming region is overlapped with the conductive film;

wherein the low concentration impurity region is overlapped with a portion of the conductive film;

wherein at least one selected from the group consisting of a source region and a drain region comprises the high concentration impurity region;

15 irradiating with a first laser light from the first surface and with a second laser light from a second surface of the translucent substrate during heating the translucent substrate from the second surface to activate the impurity,

wherein the second laser light is a portion of the first laser light which is transmitted through the translucent substrate and reflected by a reflector;

20 wherein the reflector is formed adjacent to the second surface of the translucent substrate.

3. A method of manufacturing a semiconductor device, said method comprising the steps of:

25 forming a semiconductor film over a first surface of a translucent substrate;

forming an insulating film on the semiconductor film;
forming a conductive film on the insulating film;
introducing an impurity into the semiconductor film to form a channel
forming region, at least a low concentration impurity region and at least a high
5 concentration impurity region;
wherein the channel forming region is overlapped with the conductive
film;
wherein the low concentration impurity region is overlapped with a
portion of the conductive film;
10 wherein at least one selected from the group consisting of a source region
and a drain region comprises the high concentration impurity region;
irradiating with a first laser light from the first surface in a slant direction
with respect to the translucent substrate and with a second laser light from a second
surface of the translucent substrate to activate the impurity,
15 wherein the second laser light is a portion of the first laser light which is
transmitted through the translucent substrate and reflected by a reflector;
wherein the reflector is formed adjacent to the second surface of the
translucent substrate.

4. A method of manufacturing a semiconductor device, said method
20 comprising the steps of:
forming a first semiconductor film over a first surface of a translucent
substrate;
introducing a metal element into the first semiconductor film;
first heating the first semiconductor film to form a second semiconductor
25 film;

- forming an insulating film on the second semiconductor film;
forming a conductive film on the insulating film;
introducing an impurity into the second semiconductor film to form a
channel forming region, at least a low concentration impurity region and at least a
5 high concentration impurity region;
wherein the channel forming region is overlapped with the conductive
film;
wherein the low concentration impurity region is overlapped with a
portion of the conductive film;
10 wherein at least one selected from the group consisting of a source region
and a drain region comprises the high concentration impurity region;
second heating the second semiconductor film;
irradiating with a first laser light from the first surface and with a second
laser light from a second surface of the translucent substrate to activate the
15 impurity,
wherein the second laser light is a portion of the first laser light which is
transmitted through the translucent substrate and reflected by a reflector;
wherein the reflector is formed adjacent to the second surface of the
translucent substrate.
- 20 5. A method of manufacturing a semiconductor device, said method
comprising the steps of:
forming a first semiconductor film over a first surface of a translucent
substrate;
introducing a metal element into the first semiconductor film;
25 first heating the first semiconductor film to form a second semiconductor

film;

forming an insulating film on the second semiconductor film;

forming a conductive film on the insulating film;

5 introducing an impurity into the second semiconductor film to form a channel forming region, at least a low concentration impurity region and at least a high concentration impurity region;

wherein the channel forming region is overlapped with the conductive film;

10 wherein the low concentration impurity region is overlapped with a portion of the conductive film;

wherein at least one selected from the group consisting of a source region and a drain region comprises the high concentration impurity region;

second heating the second semiconductor film;

15 irradiating with a first laser light from the first surface and with a second laser light from a second surface of the translucent substrate during third heating the translucent substrate from the second surface to activate the impurity,

wherein the second laser light is a portion of the first laser light which is transmitted through the translucent substrate and reflected by a reflector;

20 wherein the reflector is formed adjacent to the second surface of the translucent substrate.

6. A method of manufacturing a semiconductor device, said method comprising the steps of:

forming a first semiconductor film over a first surface of a translucent substrate;

25 introducing a metal element into the first semiconductor film;

first heating the first semiconductor film to form a second semiconductor film;

forming an insulating film on the second semiconductor film;

forming a conductive film on the insulating film;

5 introducing an impurity into the second semiconductor film to form a channel forming region, at least a low concentration impurity region and at least a high concentration impurity region;

wherein the channel forming region is overlapped with the conductive film;

10 wherein the low concentration impurity region is overlapped with a portion of the conductive film;

wherein at least one selected from the group consisting of a source region and a drain region comprises the high concentration impurity region;

second heating the second semiconductor film;

15 irradiating with a first laser light from the first surface in a slant direction with respect to the translucent substrate and with a second laser light from a second surface of the translucent substrate to activate the impurity,

wherein the second laser light is a portion of the first laser light which is transmitted through the translucent substrate and reflected by a reflector;

20 wherein the reflector is formed adjacent to the second surface of the translucent substrate.

7. A method according to claim 2,

wherein the translucent substrate is heated at a temperature in a range of 100-450°C.

8. A method according to claim 5,

wherein the translucent substrate is heated at a temperature in a range of 100-450°C in the third heating step.

9. A method according to claim 1,

5 wherein a first element comprises at least one selected from the group consisting of He, Ne, Ar, Kr and Xe,

wherein a second element comprises at least one selected group 15 in the periodic table,

10 wherein the impurity comprises at least one selected from the group consisting of the first and second elements.

10. A method according to claim 1,

wherein a first element comprises at least one selected from the group consisting of He, Ne, Ar, Kr and Xe,

15 wherein a second element comprises at least one selected group 13 in the periodic table,

wherein the impurity comprises at least one selected from the group consisting of the first and second elements.

11. A method according to claim 1,

20 wherein a first element comprises at least one selected from the group consisting of He, Ne, Ar, Kr and Xe,

wherein a second element comprises at least one selected group 15 in the periodic table,

wherein a third element comprises at least one selected group 13 in the

periodic table,

wherein the impurity comprises at least one selected from the group consisting of the first, second and third elements.

12. A method according to claim 1,

5 wherein a first element comprises at least one selected group 15 in the periodic table,

wherein a second element comprises at least one selected group 13 in the periodic table,

10 wherein the impurity comprises at least one selected from the group consisting of the first and second elements.

13. A method according to claim 1,

wherein the reflector has a curved surface to reflect the first laser light.

14. A method according to claim 1,

15 wherein the reflector has rugged portions on a reflecting surface thereof to effect diffuse reflection of the first laser light.

15. A method according to claim 1,

wherein each of the first and second laser light has a wavelength in a range of 300 nm or more.

20 16. A method according to claim 1,

wherein each of the first and second laser light is one selected from the

group consisting of a pulse oscillation type gas laser, a continuous light emitting type gas laser, a solid laser and a metallic laser.

17. A method according to claim 4,

wherein the metal element comprises at least one selected from the group
5 consisting of Fe, Co, Ni, Ru, Rh, Pd, Os, Ir, Pt, Cu, Ag, Au, Sn, and Sb.

18. A method according to claim 1,

wherein the semiconductor device is one selected from the group
consisting of an active matrix type liquid crystal display, an active matrix type EC
display and an active matrix type light emitting display.

10 19. A method according to claim 1,

wherein the semiconductor device is one selected from the group
consisting of a personal computer, a video camera, a mobile computer, a goggle type
display, a player using a record medium recorded with programs, a digital camera,
a front type projector, a rear type projector, a portable telephone, a portable book
15 and a display.

20. A method according to claim 2,

wherein a first element comprises at least one selected from the group
consisting of He, Ne, Ar, Kr and Xe,

wherein a second element comprises at least one selected group 15 in the
20 periodic table,

wherein the impurity comprises at least one selected from the group
consisting of the first and second elements.

21. A method according to claim 2,

wherein a first element comprises at least one selected from the group consisting of He, Ne, Ar, Kr and Xe,

5 wherein a second element comprises at least one selected group 13 in the periodic table,

wherein the impurity comprises at least one selected from the group consisting of the first and second elements.

22. A method according to claim 2,

10 wherein a first element comprises at least one selected from the group consisting of He, Ne, Ar, Kr and Xe,

wherein a second element comprises at least one selected group 15 in the periodic table,

wherein a third element comprises at least one selected group 13 in the periodic table,

15 wherein the impurity comprises at least one selected from the group consisting of the first, second and third elements.

23. A method according to claim 2,

wherein a first element comprises at least one selected group 15 in the periodic table,

20 wherein a second element comprises at least one selected group 13 in the periodic table,

wherein the impurity comprises at least one selected from the group consisting of the first and second elements.

24. A method according to claim 2,
wherein the reflector has a curved surface to reflect the first laser
light.

25. A method according to claim 2,
5 wherein the reflector has rugged portions on a reflecting surface thereof
to effect diffuse reflection of the first laser light.

26. A method according to claim 2,
wherein each of the first and second laser light has a wavelength in a
range of 300 nm or more.

10 27. A method according to claim 2,
wherein each of the first and second laser light is one selected from the
group consisting of a pulse oscillation type gas laser, a continuous light emitting type
gas laser, a solid laser and a metallic laser.

28. A method according to claim 2,
15 wherein the semiconductor device is one selected from the group
consisting of an active matrix type liquid crystal display, an active matrix type EC
display and an active matrix type light emitting display.

29. A method according to claim 2,
wherein the semiconductor device is one selected from the group
20 consisting of a personal computer, a video camera, a mobile computer, a goggle type
display, a player using a record medium recorded with programs, a digital camera,

a front type projector, a rear type projector, a portable telephone, a portable book and a display.

30. A method according to claim 3,

wherein a first element comprises at least one selected from the group
5 consisting of He, Ne, Ar, Kr and Xe,

wherein a second element comprises at least one selected group 15 in the periodic table,

wherein the impurity comprises at least one selected from the group consisting of the first and second elements.

10 31. A method according to claim 3,

wherein a first element comprises at least one selected from the group consisting of He, Ne, Ar, Kr and Xe,

wherein a second element comprises at least one selected group 13 in the periodic table,

15 wherein the impurity comprises at least one selected from the group consisting of the first and second elements.

32. A method according to claim 3,

wherein a first element comprises at least one selected from the group consisting of He, Ne, Ar, Kr and Xe,

20 wherein a second element comprises at least one selected group 15 in the periodic table,

wherein a third element comprises at least one selected group 13 in the periodic table,

wherein the impurity comprises at least one selected from the group consisting of the first, second and third elements.

33. A method according to claim 3,
wherein a first element comprises at least one selected group 15 in the periodic table,
wherein a second element comprises at least one selected group 13 in the periodic table,
wherein the impurity comprises at least one selected from the group consisting of the first and second elements.

10 34. A method according to claim 3,
wherein the reflector has a curved surface to reflect the first laser light.

35. A method according to claim 3,
wherein the reflector has rugged portions on a reflecting surface thereof
15 to effect diffuse reflection of the first laser light.

36. A method according to claim 3,
wherein each of the first and second laser light has a wavelength in a range of 300 nm or more.

37. A method according to claim 3,
20 wherein each of the first and second laser light is one selected from the group consisting of a pulse oscillation type gas laser, a continuous light emitting type

gas laser, a solid laser and a metallic laser.

38. A method according to claim 3,

wherein the semiconductor device is one selected from the group consisting of an active matrix type liquid crystal display, an active matrix type EC
5 display and an active matrix type light emitting display.

39. A method according to claim 3,

wherein the semiconductor device is one selected from the group consisting of a personal computer, a video camera, a mobile computer, a goggle type display, a player using a record medium recorded with programs, a digital camera,
10 a front type projector, a rear type projector, a portable telephone, a portable book and a display.

40. A method according to claim 4,

wherein a first element comprises at least one selected from the group consisting of He, Ne, Ar, Kr and Xe,

15 wherein a second element comprises at least one selected group 15 in the periodic table,

wherein the impurity comprises at least one selected from the group consisting of the first and second elements.

41. A method according to claim 4,

20 wherein a first element comprises at least one selected from the group consisting of He, Ne, Ar, Kr and Xe,

wherein a second element comprises at least one selected group 13 in the

periodic table,

wherein the impurity comprises at least one selected from the group consisting of the first and second elements.

42. A method according to claim 4,

5 wherein a first element comprises at least one selected from the group consisting of He, Ne, Ar, Kr and Xe,

wherein a second element comprises at least one selected group 15 in the periodic table,

10 wherein a third element comprises at least one selected group 13 in the periodic table,

wherein the impurity comprises at least one selected from the group consisting of the first, second and third elements.

43. A method according to claim 4,

15 wherein a first element comprises at least one selected group 15 in the periodic table,

wherein a second element comprises at least one selected group 13 in the periodic table,

wherein the impurity comprises at least one selected from the group consisting of the first and second elements.

20 44. A method according to claim 4,

wherein the reflector has a curved surface to reflect the first laser light.

45. A method according to claim 4,

wherein the reflector has rugged portions on a reflecting surface thereof to effect diffuse reflection of the first laser light.

46. A method according to claim 4,

5 wherein each of the first and second laser light has a wavelength in a range of 300 nm or more.

47. A method according to claim 4,

10 wherein each of the first and second laser light is one selected from the group consisting of a pulse oscillation type gas laser, a continuous light emitting type gas laser, a solid laser and a metallic laser.

48. A method according to claim 4,

wherein the semiconductor device is one selected from the group consisting of an active matrix type liquid crystal display, an active matrix type EC display and an active matrix type light emitting display.

15 49. A method according to claim 4,

20 wherein the semiconductor device is one selected from the group consisting of a personal computer, a video camera, a mobile computer, a goggle type display, a player using a record medium recorded with programs, a digital camera, a front type projector, a rear type projector, a portable telephone, a portable book and a display.

50. A method according to claim 5,

wherein a first element comprises at least one selected from the group consisting of He, Ne, Ar, Kr and Xe,

wherein a second element comprises at least one selected group 15 in the periodic table,

5 wherein the impurity comprises at least one selected from the group consisting of the first and second elements.

51. A method according to claim 5,

wherein a first element comprises at least one selected from the group consisting of He, Ne, Ar, Kr and Xe,

10 wherein a second element comprises at least one selected group 13 in the periodic table,

wherein the impurity comprises at least one selected from the group consisting of the first and second elements.

52. A method according to claim 5,

15 wherein a first element comprises at least one selected from the group consisting of He, Ne, Ar, Kr and Xe,

wherein a second element comprises at least one selected group 15 in the periodic table,

20 wherein a third element comprises at least one selected group 13 in the periodic table,

wherein the impurity comprises at least one selected from the group consisting of the first, second and third elements.

53. A method according to claim 5,

wherein a first element comprises at least one selected group 15 in the periodic table,

wherein a second element comprises at least one selected group 13 in the periodic table,

5 wherein the impurity comprises at least one selected from the group consisting of the first and second elements.

54. A method according to claim 5,

wherein the reflector has a curved surface to reflect the first laser light.

10 55. A method according to claim 5,

wherein the reflector has rugged portions on a reflecting surface thereof to effect diffuse reflection of the first laser light.

56. A method according to claim 5,

15 wherein each of the first and second laser light has a wavelength in a range of 300 nm or more.

57. A method according to claim 5,

wherein each of the first and second laser light is one selected from the group consisting of a pulse oscillation type gas laser, a continuous light emitting type gas laser, a solid laser and a metallic laser.

20 58. A method according to claim 5,

wherein the metal element comprises at least one selected from the group

consisting of Fe, Co, Ni, Ru, Rh, Pd, Os, Ir, Pt, Cu, Ag, Au, Sn, and Sb.

59. A method according to claim 5,

wherein the semiconductor device is one selected from the group consisting of an active matrix type liquid crystal display, an active matrix type EC display and an active matrix type light emitting display.

60. A method according to claim 5,

wherein the semiconductor device is one selected from the group consisting of a personal computer, a video camera, a mobile computer, a goggle type display, a player using a record medium recorded with programs, a digital camera, a front type projector, a rear type projector, a portable telephone, a portable book and a display.

61. A method according to claim 6,

wherein a first element comprises at least one selected from the group consisting of He, Ne, Ar, Kr and Xe,

wherein a second element comprises at least one selected group 15 in the periodic table,

wherein the impurity comprises at least one selected from the group consisting of the first and second elements.

62. A method according to claim 6,

wherein a first element comprises at least one selected from the group consisting of He, Ne, Ar, Kr and Xe,

wherein a second element comprises at least one selected group 13 in the

periodic table,

wherein the impurity comprises at least one selected from the group consisting of the first and second elements.

63. A method according to claim 6,

5 wherein a first element comprises at least one selected from the group consisting of He, Ne, Ar, Kr and Xe,

wherein a second element comprises at least one selected group 15 in the periodic table,

10 wherein a third element comprises at least one selected group 13 in the periodic table,

wherein the impurity comprises at least one selected from the group consisting of the first, second and third elements.

64. A method according to claim 6,

15 wherein a first element comprises at least one selected group 15 in the periodic table,

wherein a second element comprises at least one selected group 13 in the periodic table,

wherein the impurity comprises at least one selected from the group consisting of the first and second elements.

20 65. A method according to claim 6,

wherein the reflector has a curved surface to reflect the first laser light.

66. A method according to claim 6,

wherein the reflector has rugged portions on a reflecting surface thereof to effect diffuse reflection of the first laser light.

67. A method according to claim 6,

5 wherein each of the first and second laser light has a wavelength in a range of 300 nm or more.

68. A method according to claim 6,

10 wherein each of the first and second laser light is one selected from the group consisting of a pulse oscillation type gas laser, a continuous light emitting type gas laser, a solid laser and a metallic laser.

69. A method according to claim 6,

wherein the metal element comprises at least one selected from the group consisting of Fe, Co, Ni, Ru, Rh, Pd, Os, Ir, Pt, Cu, Ag, Au, Sn, and Sb.

70. A method according to claim 6,

15 wherein the semiconductor device is one selected from the group consisting of an active matrix type liquid crystal display, an active matrix type EC display and an active matrix type light emitting display.

71. A method according to claim 6,

20 wherein the semiconductor device is one selected from the group consisting of a personal computer, a video camera, a mobile computer, a goggle type display, a player using a record medium recorded with programs, a digital camera,

a front type projector, a rear type projector, a portable telephone, a portable book and a display.

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